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ENGAGE: A Game Based Learning and Problem Solving Framework (Task 1 Month 5)
Progress, Status and Management Report
Monthly Progress Report

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Technical Information

1. Technical Progress / Highlights - Observations

Through the month of July, we focused on integration of the individual games into the overworld, feature development for the Teacher Control Panel, and improving the games in response to the actionable feedback we gained from playtesting with kids from summer school programs.

For Refraction, we worked on improving the visibility and clarity of the pieces on the board, revamping much of the art in the game in response to issues uncovered through playtests. We also tested several different ways of improving the click-and-drag mechanic in order to accommodate children who may not have fully developed motor skills with the computer mouse. In Treefrog Treasure, we analyzed gameplay logs, created new levels, and modified the fraction representations to better align with Common Core math standards. Our multiplayer card game Creature Capture now supports an offline multiplayer mode (sharing a single computer), in response to feedback from teachers that a large number of children play in this manner. For the overworld, we continued to develop features aimed at retaining interest and engagement over the mid to long term. These engagement tools include longer-term goals, an increased variety of rewards and customization options, and time-based events that give players a reason to return to the world over weeks or months.

We began the process of experiment design and pre- and post- test design for a new set of studies to be run beginning in the fall. The assessment aims to include three types of questions:

1. Near Transfer questions— these assess whether or not the students learned the concepts covered in the game at a somewhat basic level.
2. Difficult ("hard") Near Transfer questions— these assess whether or not the students learned the concepts in the game at a more advanced level, showing a deeper understanding of those concepts.
3. Far Transfer questions— these aim to asses transfer to problems that have the same underlying concepts or "big ideas" in those as in the game, but that look different mathematically.

To support this, we are planning on integrating the assessments into the games themselves through a common framework.

2. Results or Problems and Solutions

One problem we are actively working on is accurately determining which mathematical concepts are referenced by game actions at a level granular enough for us to assess a player's mastery across multiple concepts. For example, in Creature Capture, a 1/6 vs 1/2 battle with no powers entails the concept of unit fraction comparison. In a 1/6+1/3 vs 1/2*1/3 battle, the concepts are addition with similar denominators, multiplication of unit fractions, unit fraction comparison. Therefore the game requires a function that determines, for any set of two monsters (+ up to two powers, one per monster), what concepts are involved. Then we can score performance across those concepts.

3. Significant Accomplishments Anticipated During Next Reporting Period

The games Refraction, Treefrog Treasure, Creature Capture and the Planetopia overworld will be ready for use by a number of physical schools as well as integrated into multiple online teaching resources. The games will be connected to the Teacher Control Panel with basic assessment algorithms that will be

modified over time as we gather data. The games will support presenting pre- and post- test questions via a common testing and logging framework.

4. Publications relevant to this effort

No new research papers were published in the July $1 - 31^{st}$ timeframe.

5. Meetings and Events (Please include meetings with subcontractors)

Presentations about on our work at the following conferences:

- UW MSR Summer Institute 2012: Crowdsourcing Personalized Online Education
- The 67th Annual Association of Medical Illustrators Meeting: Illuminate: Exploring Ideas in Biomedical Visual Communication
- Mensa Colloquium: 2012 Social and Video Games
- The Conference on Public Participation in Scientific Research (PSSR)

6. Changes to the Contract Organization

None.